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A NEW SCOTOMETER

By Col. R. H. Elliot, I.M.S.

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MARCH, 1919

COMMUNICATIONS

A NEW FORM OF BIFOCAL LENS*

BY

PERCY C. BARDSLEY,

SALISBURY.

THERE has arisen a school of ophthalmologists who teach that in early life myopia should be fully corrected, and that this full correction, however high it may be, should be continuously worn under all the conditions of modern life with its many hours of strenuous close work.

The argument of this school is, that the eye correction only turns the child or young adult with myopia into a person with normal vision, and thereby the accommodation is called into play as is the accommodation of an emmetrope or hypermetrope. Moreover, they state boldly that if this full correction is not given certain dire results will follow. The accommodative power will be lost; and, far worse, rapid progressive myopia will take place.

This terrible result is stated by one section to be due to the flexing of the neck and head over books, and the consequent bulging of the eyes, and is illustrated by suspending rabbits by

*Read in the Section of Ophthalmology of the Royal Society of Medicine on June 12, 1918.

their tails for several days; other sections ascribe the result to pressure on the globe from undue use of this or that rectus or oblique muscle; other sections again explain this result by one of the numerous unverified hypotheses of the causation of myopia, the one which happens to be popular at the moment.

This statement that lack of full correction of myopia increases the myopia, is asserted with a dogmatism worthy of a Cameronian Covenanter but no real evidence thereof is given to us.

We are assured that the teaching is novel, which it well may be, for the last generation indulged less in unproved assumptions.

This school forgets that, like the poor, myopes have been always with us, or at least ever since Nero wore his monocle. The giants of thirty years ago were quite as familiar as we are with all forms of myopia and with inconvenience to the wearer of frequently changing his glasses for near or far vision.

They seldom insisted on the myopes reading with full correction, and they did not *imagine* that evil results followed.

The writer has had the fortune or misfortune, from whichever standpoint it may be regarded (and he certainly does not regard it altogether as the latter), to have been myopic since early childhood.

Though the myopia was not high, and has increased very little since, he objected, both in boyhood and youth, to prolonged study in glasses of full correction. This objection was not due to lack of accommodative power, nor did any weakness of accommodation result therefrom. When well over forty years of age his accommodation was tested at an Ophthalmological Congress at Oxford, and found to be more powerful than any recorded up to that date.

The writer found that fully correcting glasses did not place him in the same position as the emmetrope, but introduced him into a microcosmos; and this every myope discovers for himself. In this contracted world the diminished image of the reading types produced a retinal fatigue that made him rejoice to go back to the larger image of the weaker glasses. On this personal evidence, he would ask, why should myopes be robbed of their privilege of reading without using their ciliary muscles? The more so since, above others, they love their books!

The preference of the writer for weaker reading glasses led him early in adult life to adopt bifocals. These were at first of the ordinary pattern. Shortly after commencing the study of ophthalmology, it was brought home to him, that in looking down through the lower glass of the ordinary bifocals, considerable distortion of the image was produced.

It may surprise the reader to be informed that a sphere of 4D. tilted 20° produces a cylinder of 0·5D.

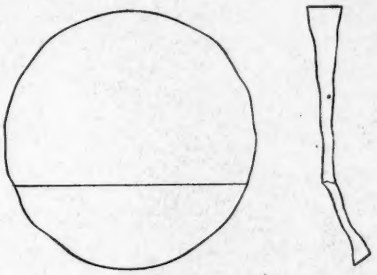
Now, in the ordinary bifocals when the upper glass is set at right

angles to the visual axis, the lower glass is tilted not less than 20° and probably nearer 30°, to that axis, with the eyeballs rotated downwards for reading.

A tilt of 30° is equal to a cyl. of 0·31D. for every degree of sphere, *i.e.*, in a sphere of 10D., a cylinder of 3D. is introduced.

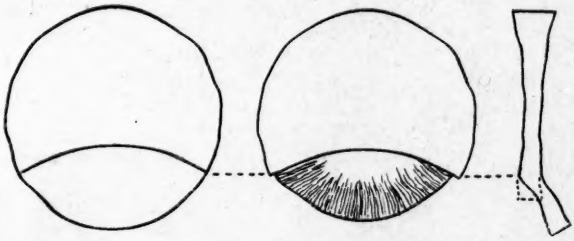
To overcome this cylindrical eflect I, the writer, angled my bifocals. They were made of separate pieces of glass slightly bevelled against one another where the pieces met.

At first I had the line of division straight across thus:



This arrangement, while simple to make, labours under the great disadvantage that it bestows an exaggerated importance on the reading glass and blurs much of the lower temporal field for distance. This is a grave handicap in walking, especially up and down stairs, and is sufficient to deter many patients from wearing bifocals.

Next I angled circular bifocals thus:



Here the difficulty was to bring the edges of upper and lower glass into continuous contact. This difficulty was overcome by grinding a toric curve on the upper lens, and a double concave or convex on the lower lens. I obtained immense satisfaction and

comfort from these glasses and have worn them continuously for over twenty years. It may be well to mention here that it is rarely possible to angle the glasses above 20° owing to the configuration of the cheeks; but as the cylindrical effect of tilting a sphere rises in a geometrical and not an arithmetical proportion to the angle of tilt this is of small moment. For example: suppose the lower lens is a 4D. sphere and the angle of tilting is 30°, the cylindrical result will be 1.24D. Now, if the lens is angled 20°, only 10° of the tilting will remain, and the cylindrical effect will be only 0·11D.

The curved angular bifocals mentioned above possess the following faults:

1. They are expensive, because the opticians find them troublesome to put together, and are apt to crack the lenses in doing so. After prolonged use they tend to work loose and fall out.

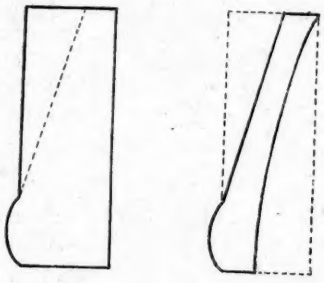
2. The dividing line between the lenses is pronounced, and although some patients soon learn to ignore it, some nervy ones are unable to. Dust also settles on the line of union and accentuates it.

3. The most ardent admirer of this type of bifocals could not deny its ugliness.

For these reasons I have long been striving to solve the problem of making these angular bifocals in one piece of glass. Some eight years ago I placed the problem before Mr. J. B. Rayner, of Vere Street. Mr. Rayner has hit on a solution of the difficulty which gives us almost all that we require.

A thick blank is obtained from one of the patentees of the invisible bifocal lenses, with a reading sphere (say, a 2D. sphere) ground, fused, or cemented upon its lower part.

Thus:



This is then ground off along the line to give the angle of 15° to 20°.

On the inner surface the refraction curve is ground common to both lenses.

The writer has worn a pair of these bifocals for several months and they leave little to be desired. They are perfectly comfortable, easy to clean and almost invisible as bifocals.

To anticipate a few obvious objections:

1. At present these angular bifocals cannot be made in convex glasses, but only in concave combinations. Mr. Rayner is sanguine that later he will discover a method of angling convex circular bifocals.

2. The faint line straight across the lens where the angling takes place does not impede walking, for the power of the lower temporal glass below the line is the same as above. The diffraction from the line is very slight and very quickly ignored.

3. A cylinder can be ground in with the common curve and, if vertical or horizontal, is correct for the two centres. If the cylinder is at 45° it can still be made common to the two centres, but the centres are not directly in the vertical line. This can be overcome and the lower centre brought vertically under the upper by slightly tilting the horizontal angular line.

4. When a myopic patient can read comfortably in full distance correction, angular bifocals of equal power will be an advantage. They will do away with the prismatic effect produced by looking below the centre of a high lens, and give a properly centred reading portion.

In conclusion:

5. I am not a sufficiently good mathematician to be certain of the verity of my tables of the cylindrical effect of tilting a sphere. I therefore sought the help of an old friend of mine, Prof. A. H. Fison, an astronomer, and a lecturer on physics at Guy's Hospital School. Prof. Fison has worked out tables which are accurate to a second of arc. His results show that my figures are too low and the amount of cylindrical error produced by tilting is somewhat greater than I have given in my paper.*

* We hope to publish Dr. Fison's paper at a later date.

THE BEGINNINGS OF FUNDUS ILLUSTRATION

BY

W. WALLACE, M.D.

CAPTAIN, R.A.M.C.

THE earliest drawings of the fundus have a special interest in showing what the first ophthalmologists saw, or thought they saw, with their imperfect instruments. Helmholtz published his pamphlet, *Beschreibung eines Augenspiegels zur Untersuchung der Netzhaut im lebenden Auge*, in 1851, and consequently that date is our starting-point. He supplied a diagram of his instrument, but did not go the length of enlightening us as to the appearances which the fundus presented to him. Others, however, were less reticent, and hidden away in the dusty Archives and Transactions of small local societies, now forgotten, there may be drawings illustrating features which must have been a wonder to their observers. Of these it is difficult to say who was the first to publish a sketch, and we have to rely upon such material as is accessible in our scientific libraries at the present time.

1853. The earliest dated essay containing plates of the fundus is by A. C. Van Trigt, entitled *De Speculo Oculi*, and published "ad Rhenum," (Utrecht), in 1853. It is in Latin, and gives seven primitive lithographs in black and white, small in size. He describes conditions, but the illustrations, except one of detached retina, do not correspond.

1854. The above-named work seems to have met with some success, for, a year later, a translation by C. H. Schauenburg was published at Lahr in Baden under the title *Der Augenspiegel, seine Anwendung und Modificationen*. It is clear that from the first the apparatus of Helmholtz did not satisfy those who adopted it, and in the early years of ophthalmoscopy every investigator appears to have been convinced that there was more to be seen in the fundus than was possible with the instrument at his command, and accordingly he sought for something better, resorting to complicated machinery for his purpose. The refractive error of the patient, and possibly of the observer, must have been a stumbling-block, and there must have been many exasperating moments when a lesion, which the observer felt ought to be visible, baffled his efforts to focus it with his imperfect appliances.

The same year saw further publications. In the *Annales d'Oculistique* for 28 February, Dr. Anagnostakis appended to an *Essai sur l'Exploration de la Rétine*, a few rough plates, etched by Dr. Barre, and coloured by hand. They are very elementary, and have no special significance.

Two months later, on 27 April, Jaeger presented his paper, *Ergebnisse der Untersuchung des menschlichen Auges mit*

dem Augenspiegel. This was accompanied by eight large plates in colour, and was afterwards published in the *Transactions of the Imberial-Royal Academy of Science,* Vienna, in February, 1855. The drawings were destined to lay the foundations of that spacious gallery of pictures which is, perhaps, the most enduring monument of this pioneer ophthalmologist. We shall have occasion to refer once again to his work, but meanwhile we will follow the chronological sequence.

In this year also we find the first and second parts of the large folio by Ruete, *Physikalische Untersuchung des Auges,* issued at Leipzig, and completed in 1860, with the ninth part. The drawings are on copper-plate, and coloured by hand. The majority illustrate external diseases, and are executed with great minuteness; but there are many of the fundus as well. These are represented as seen through the pupil; the iris, lids, and eyebrow being included without any clear object. The fundi are only an inch in diameter, and the technique is remarkable in showing so much in so tiny a space. They do not all convey appearances which can be identified in the light of experience. With an imperfect instrument this was to be expected, the more so as Ruete had to depend entirely upon his own observation for his inferences; but they are the first attempt to plan systematically an atlas on an extensive scale. His pictures evidently set the fashion, not only as regards size and technique, but also, and not always with acknowledgment, as regards subject and detail. They attracted attention in this country, for in some English publications, presently to be referred to, we shall find several reproduced.

1855. The second edition of *Ophthalmic Medicine and Surgery,* by Wharton Jones, bears this date. One plate of the fundus, or "bottom of the eye," is given, but it conveys nothing, and the ophthalmoscope is dismissed in a couple of pages. In the French edition, a translation from the third English edition, by Foucher, published in Paris in 1862, there are three coloured prints of the fundus. One shows the arteries confined to the temporal side of the disc and retina, and the veins only on the nasal side. The other two—one after Follin—show all the vessels having a common origin, arteries and veins being traced to one main trunk. There are, besides, very rough wood-cuts, which need the description in the text to explain them.

1856. In this year, Dr. Louis De La Calle presented his Thesis *De l'Ophthalmoscope,*[*] for his degree of Doctor of Medicine. He shows eleven lithographs in monochrome, on a reduced scale, with thread-like vessels. They do not throw any light on pathological conditions.

[*] In the French works cited the more classic orthography, "*ophth.*," had not yet been displaced by the form now in use.

1857 (?) About this date Liebreich appears with his *Atlas of Ophthalmoscopy*; but this is conjectural, for the first Edition is alluded to as having been published in Paris and Berlin in 1863. The second edition was translated by Swanzy and published in London in 1870. This Atlas, whatever its date, was in existence before Jaeger brought out his larger series of plates, for the Viennese ophthalmologist roundly condemned it for incorrectness of anatomical and pathological details. It is possible that Liebreich was familiar with Jaeger's first drawings, and being himself an artist and connoisseur, endeavoured to outstrip Jaeger, as Jaeger had outstripped Ruete. Whatever the private and personal grounds for the attack, it is undoubted that Jaeger's strictures were justified in many instances, but, as will be seen later, there was a sharp rejoinder, on the part, too, of one who, if not a compatriot, was at least co-lingual.

This Atlas was the first complete work of its kind to depart from the minute scale favoured by Ruete. Liebreich went to the opposite extreme, and in filling in the details of his large plates did not allow himself to be beaten by mere anatomical trifles. It is, nevertheless, an achievement which, far from being overshadowed by contemporary work, stands out as a landmark in ophthalmoscopy, and Jaeger himself need not have been ashamed to sign many of the drawings.

1857-59. The first volume of our *Royal London Ophthalmic Hospital Reports* refers to these years, and it and the following volume, 1859-60, contain small drawings, illustrative of papers by C. Bader. These drawings were published separately in the form of a small Atlas in 1868. In spite of the fact that Jaeger had standardized, as it were, the style and manner in which the fundus should be depicted, we find the example of Ruete perpetuated in these drawings, and the inference is that Bader wished to show his skill with the ophthalmoscope rather than to represent actual appearances with accuracy. In some instances discs are drawn less than four millimetres in diameter, and the minuteness of the scale suggests that the indirect method was used. The draughtsman was one Schweitzer, and the lithography, as was the practice in illustrations by this process in this period, was carried out in Germany.

1858. In this year the first book in English on the Ophthalmoscope appeared. It was by Jabez Hogg, and was a reprint of his paper in the *Lancet* of the preceding year. Its illustrations consisted of wood-blocks which the author, with some justification, excused as they "imperfectly represent the appearances described," and eight tiny coloured lithographs, four taken from Ruete and one from Wharton Jones. The conditions in these miniatures call for some imagination if they are to be interpreted in the light of our

present-day knowledge. Hogg enlarged his little pamphlet in 1863, under the title of *A Manual of Ophthalmoscopic Surgery*, and repeated the drawings of the smaller work with the addition of several more.

1862. The next book in chronological order is Zander's *Augenspiegel*, the second edition of which was published in 1862, followed in 1864 by an English edition translated by R. Brudenell Carter. Both editions contain decidedly quaint lithographs in colour by Singer of Leipzig. In one, a detachment of the retina is represented as bright blue, and the reds are indifferent in quality.

In this year Italy contributes to the list. Gritti published in Milan an extensive treatise, *Dell'Ottalmoscopo e delle Malattie end-oculari per esso riconoscibili*. This has lithographs in black and white by himself, somewhat coarse in execution, but recognizable as showing retinitis albuminurica, hæmorrhagica, and pigmentosa, sclerosis and cupping. These conditions are correctly described in the text, although his nomenclature is different from that adopted in modern practice.

1866. By this time ophthalmologists were directing their attention to ocular manifestations of diseases in the brain, and in this year Bouchut published his work entitled, *Du Diagnostic des Maladies du Système Nerveux par l'Ophthalmoscopie*, with a small *Atlas* of plates. Illustrations of papilloedema can be recognized, although the drawings are incomplete in detail. He also shows the fundus of a dog and of a rabbit in which the characteristics are fairly well observed. These drawings are the earliest that I have come across in this sphere of ophthalmology.

1870. Our sequence at this point becomes confused owing to lack of information as to when the first edition of Jaeger's *Beitraege zur Pathologie des Auges* was published. The second edition is dated 1870, and is in small folio. The plates are large-scale representations of many of those given in the first edition of the *Traité des Maladies du Fond de l'Œil et Atlas d'Ophthalmoscopie*, which Jaeger, in collaboration with de Wecker, published in Paris and Vienna in that year. The de Wecker and Jaeger work is valuable in that each author writes his own preface, dealing with the condition of ophthalmology at that time; but the interest for us, at any rate as far as this investigation is concerned, lies in Jaeger's criticisms of contemporary illustrations. Bader, who made out the macula to be blue, is shown scant mercy, while Ruete, upon whom he, apparently, based his style, is commended. The criticisms of Liebreich, already referred to, and of Bouchut and Magnus, to be discussed presently, are harsh; but I have not been able to trace a copy of Martin's *Traité pratique des Maladies des Yeux*, published in Paris in 1863, which likewise is not spared.

In these strictures it is difficult to discriminate between Jaeger the acute observer, and Jaeger the skilled artist jealous for his handiwork. There is little doubt in my mind that when Ruete's large folio became accessible, pernicious and dangerous conventions associated with mere names of diseases were adopted by draughtsmen, who depicted not what they themselves had seen, but what others had noted. It is not going too far to say that many colour-illustrations of typical examples that abound in modern text-books bear the traces of their pedigrees and ancestry, and this seems to be due to a desire to produce a nice picture rather than a veracious aspect of the thing seen.

After a study of the works which Jaeger catalogued in his *index expurgatorius*, it is clear that he was right. But even he is not beyond reproach. He enters a plea, admittedly justifiable, for the expense and costliness of producing an Atlas within reasonable price, and we readily make allowances for the monotony of colour that predominates in many of his plates. At the same time we have to remember that between 1870 and 1890, when the English edition was published with the identical plates, some progress had been made in printing and the finer reds had become articles of commerce. When, therefore, the edition of 1890 was issued, some care should have been taken to maintain the goodly repute of the artist-ophthalmologist who had taken advantage of the opportunity for aspersing the work of his contemporaries and predecessors.

But the mote in their eye was the beam in his: different in size, shape, and colour, but still a beam. We can accept all that he says about pathological conditions, but his plates do not invariably show what he describes, particularly as to colour. It may be that he used oil as his illuminant, which would make the reds of the fundus appear more yellow than when electric light is employed. In favour of this supposition is his making atrophic conditions of the disc greenish rather than blue. In his preface to the French edition of 1870, partly quoted in the English edition of 1890, he refers to the large number of sittings which he obtained for each case, amounting to 40 or even 50, and it is not unlikely that the prolonged strain of studying one tint fatigued his sense for red. The colouring is better in the large plates of the *Beitraege* than in the reduced facsimiles in the *Atlas*. The eight plates drawn by his editor, Hardmann, and added to the edition of 1890, more nearly approach the tone of the fundus as we expect to find it represented nowadays. Jaeger claimed that he had drawn each fundus in "natural size, form, colour, and position," but the vessels are too diagrammatic, and, particularly at the disc, conform to a type without individuality. Still, the highest testimony to his fidelity towards his theme, and his anxiety to serve the art of medicine, lies in the fact that his *Atlas* is upheld as an authority.

But Jaeger was not to have things all his own way when exposing the shortcomings of adventurers in the same field as himself. Liebreich was to have his champion, for in 1870 there was published in Paris yet another Atlas, this time by A. de Montméja, called *Pathologie iconographique du Fond de l'Œil.* The drawings are by one Triollier, who contrived some strange devices. A green detachment of the retina is shown, with the vessels also green; opaque nerve fibres appear as black; a normal disc presents itself as blue, and veins cross veins and arteries cross arteries with fine impartiality. But the preface is our main concern here. Zehender is quoted, without, however, reference to the original source of his remarks, and he replies with vigour to Jaeger's attack upon Liebreich, although Montméja's drawings would have entitled Jaeger to yet another scalp. Justly or unjustly, Zehender gives us a hint of strong personal bias by asking why Jaeger never alludes to any of his colleagues in Vienna, and leaves us to infer that professional jealousy, quite as much as a desire for scientific accuracy, was at the root of Jaeger's unsparing criticisms.

1872. The *Ophthalmoscopischer Atlas,* by Hugo Magnus, that I have seen is dated 1872, but the plates must have been published before 1870, for this author is one of those whose drawings stirred Jaeger to wrath. The earlier edition, if one exists, has not been traced. There are 14 plates, poor and ludicrous, and the author seems to have relied upon his imagination and a good deal of Liebreich for some of his material.

1876. Bouchut's *Atlas d'Ophthalmoscopie medicale et de Cérébroscopie* is dated 1876, and is an amplification of the earlier work mentioned above. It cannot be said of many of the drawings that they represent the abnormalities referred to in their titles.

In the same year, Jaeger continued his studies and brought out his *Ergebnisse,* containing good lithographic drawings in black and white.

1879. This year is interesting as it is the date when Gowers published his *Manual and Atlas of Medical Ophthalmoscopy.* In spite of the drawback that only two of the plates were in colour, while the rest were autotype reproductions of his sketches, it immediately became a standard work, and it and Jaeger's *Atlas* appear to have held the field for the next few years.

1881. The first volume of the *Transactions of the Ophthalmological Society* was issued in 1881, and we find that from its earliest days the Society gave attention to drawings of cases. This volume contains plates of the fundus in monochrome, and two drawings in colour by E. Burgess, illustrating the fundi of an infant: difficult enough subjects which account for the somewhat unsatisfactory result.

But in the following volume there are remarkable pencil drawings

by Stanford Morton and A. H. Benson, which show not only immense patience, but also masterly technique with the material.

Evidently the importance of drawings was recognized by the Society, for the third volume contains the description and illustration of an ophthalmoscope for artists, devised by the late James Adams. The demand for it, however, was not sufficient to induce the makers to put it on the market. By this time the technique of fundus drawings had advanced to a stage when it was clear that they must reach an assured standard if destined for publication, and names that have become familiar in this sphere are to be found as signatures to the plates in the *Transactions*. It is interesting to follow, year by year, the work of that master of his craft, Mr. A. W. Head, and it is somewhat singular that with these specimens, which could not have failed to be accessible to ophthalmologists, the year 1886 should have seen the publication of two books with plates far behind in the quality demanded by the Ophthalmological Society for its *Transactions*.

Of these books, Loring's *Textbook of Ophthalmology* is the lesser offender, but his drawings are coarse, and the colouring, especially in the first volume, is weak.

The other is Galezowski's *Traité Iconographique d'Ophtalmologie*, but as it is only the second edition that I have traced, and as the date of the first is not given, there may be extenuating circumstances in his case. Nevertheless, it is strange that at any date after the appearance of Jaeger's *Atlas*, anyone should have considered the primitive and often meaningless drawings of Galezowski to have been worthy of publication.

The year is redeemed by the issue of Schmidt-Rimpler's *Augenheilkunde und Ophthalmologie* in a second edition. It has seven good coloured lithographs, signed by Dr. L. Justi.

From this date draughtsmen of the fundus appear to have vied with one another in producing work which had to be accurate in order to lay a claim to possess permanent value. Their plates are in the hands of every ophthalmologist now a days, and no detailed reference to them is necessary with the exception of two. That admirable achievement, *The Fundus Oculi*, by Adams Frost, with A. W. Head as his illustrator, is now a classic, and a word must be given to Kurt Adam's *Ophthalmoscopic Diagnosis*, in which the plates have been brought to a high and enviable degree of artistic technique.

This chronological record cannot be anything more than an attempt to give the ophthalmologist an idea of the birth and progress of this modest handmaid and minister to his more serious endeavours. When we consider the importance of the ophthalmoscope in everyday practice, we cannot easily reconstruct a period in which its use was seriously belittled, and with our perfected

knowledge we are apt to overlook the pioneer efforts of those early investigators and enthusiasts, who, with some bits of glass, began to explore, and to depict, the wonders of a small area of the human body which had lain hid from all conception since the birth of time. Babbage, one of the first, as far as we know, to have seen the fundus oculi, must have been so struck by the simplicity and obviousness of the apparatus required that he did not trouble himself about his discovery.

The first clear view of the fundus is to some—it ought to be to all—an eternal memory, and familiarity may have blunted the imagination so that we fail to think much about the sensations of an ophthalmologist of less than two generations past, whose descriptions of what he had seen must have aroused wild discussions, grave ponderings, and no doubt heated arguments. Thanks to them, in ophthalmology at least, we can confidently echo without vainglory,

ἡμεῖς τοι πατέρων μέγ' ἀμείνονες εὐχόμεθ' εἶναι.

It cannot but be that in the chronological list there are lacunae, inevitable owing to the times in which we live, but every endeavour has been made to search the accessible scientific libraries for material. Doubtless out-of-the-way publications, unobtainable and uncatalogued, may add to our list, but the present purpose is served if the references given are of help to those interested in the matter.

From this brief survey the reader will be able to consult these first studies of the fundus, and realize the obstacles with which the pioneers of ophthalmology had to contend. It is not uninstructive to turn over these delectable plates, executed when the science was in its infancy. Fantastic as many of the oldest are, we cannot question their having given immense joy to their authors.

Before concluding this subject, we may look ahead and ask what help photography may afford us in the future. I am not very sanguine, but science has her own way of circumventing difficulties, and I trust I may yet see photographs which will surpass the best drawings of to-day, just as our draughtsmen have thrown into the shade the pristine attempts which we have just been considering.

It is said that "satisfactory" photographs have been made, but hitherto I have not met with any that can replace drawings by hand. Even were we provided with a perfect apparatus which could focus the concavity of the fundus uniformly, avoiding reflexes, and were research and ingenuity to put at our disposal a wide range of colour, physical obstacles would still remain. The most serious of these is the state of the vitreous and lens. Many drawings have to be made with masses of haemorrhage in the vitreous, and with only a narrow gap through which the disc and a limited portion of the fundus can be made out. Central opacities

in the lens prevent a clear view except at an extreme angle, an adjustment which cannot be obtained for a camera. Detachments of the retina with bands of proliferation in the vitreous are at present outside the scope of photography. The representation of such conditions has to be a composite picture, so as to show the several planes. The human eye and hand at every turn have to make allowances and ignore opacities which in photography would give little else than a blurred negative, and the exposures necessary for focussing varying depths would put a severe tax upon the steadiness and endurance of the patient. Conceivably some means might be devised for capturing the inverted image, but as photography of this class would demand intelligent co-operation, not as a rule an outstanding virtue among hospital patients, the results would be disappointing.

These remarks, partaking of arguments which might be resorted to by an *advocatus diaboli*, are not intended to disparage the labours of others in photographing the fundus, but merely to indicate problems which must be solved before an accurate and instructive print can be obtained.

NOTE.—Since the above was written I have had the opportunity of seeing a number of drawings by that veteran ophthalmologist, Mr. Pridgin Teale, happily still with us. They were made in the year 1866, on the minute scale adopted about that time. No exception can be taken to his faithful records of detachment, opaque nerve fibres, and rupture of the choroid. They are far in advance of many published by his earlier contemporaries.

THREE CASES OF GAS INFECTION OF THE CORNEA, FOLLOWING GUNSHOT WOUNDS OF THE EYE

BY

J. A. PRINGLE, M.D.,

CAPTAIN, R.A.M.C.

DURING the present war gas gangrene has been so frequent a complication of gunshot wounds of other parts of the body that ophthalmic surgeons working at military hospitals must long ere this have been struck by the extreme rarity of the condition as affecting the eye. So far I do not know of any case having been recorded; in fact, I can discover no record of gas gangrene having occurred in face injuries of any sort. This immunity is probably due to two main factors—the extremely good blood supply of these parts, and the fact that dirty clothing is not carried into the wounds with the fragments of metal, with the added factor as far as the eye

alone is concerned that the conjunctival sac is not a favourable situation for the development of anaerobic organisms. The first of these factors does not apply to the cornea, however, as this structure is non-vascular, and entirely dependent on the lymph flow for its nutrition; any serious interference with its supply of lymph causing great damage to its vitality. In war injuries to the eye this lowering of the vitality of the cornea occurs in a considerable number of cases, but not necessarily as a result of a direct injury to the cornea; it also occurs when the ocular conjunctiva is extensively damaged, with resulting congestion and chemosis, the swollen conjunctiva very often completely hiding the cornea for the first few days. If, therefore, the organisms of gas gangrene are present either in the conjunctival sac or in the wound, the conditions necessary for their growth and development could not be more favourable.

It was not until the spring of 1917 that a case occurred in my wards, which, by its unusual features, led me to speculate as to the possibility of the cornea being the seat of a gas infection. This case unfortunately was not investigated bacteriologically, and except for the fact that my two subsequent cases followed an almost identical course, I have no grounds for recording it in this article. I merely mention it here as being the first case which aroused my suspicions and put me on the look-out for similar cases.

In June of the same year I was able for the first time to confirm my suspicions by bacteriological investigation. The patient, a private in the Army Ordnance Corps, aged 25, was admitted on June 17, with wounds of the face and eyes due to detonator explosion three days previously. His face was covered with multiple superficial wounds, all of which were septic and discharging pus. My notes on his eye condition were:

Right eye.—Vision=P.L. Superficial wounds of inner side of cornea with some dirt in the wounds. None appears to have perforated. Eye congested and dirty with muco-purulent discharge from conjunctival sac. Fundus and media normal. *Left eye.*—Vision =No P.L. Wound of cornea inner edge—perforating—edges of wound infiltrated. Eye very inflamed; mucopurulent discharge.

These notes were made when I saw the case in the morning about 9.30 o'clock. I saw the patient again about 2.30 p.m., and by that time the whole left cornea had become infiltrated, soft, and swollen, and was bulging forward at the wound; the eye was intensely inflamed and the ocular conjunctiva chemosed.

I removed the eye that afternoon, leaving a collar of sclera round the nerve head, and thoroughly irrigating the socket with 1-5,000 sublimate. The patient made an uninterrupted recovery, and was transferred to England on June 22 with a perfectly clean socket and 6/18 vision in the remaining eye. Portions of the cornea and

contents of the globe were retained for bacteriological examination, and Captain Riddle, R.A.M.C., kindly furnished me with a short report, stating that he had isolated staphylococci and a gas-forming bacillus. Unfortunately, Captain Riddle was posted to another unit before completing his investigations, and he was therefore unable to give me a fuller report on the case.

I was now convinced in my own mind that gas infection of the cornea did occur, but owing to the incomplete report of the bacteriologist, I determined to wait until a third case came under my observation, in order to obtain a full bacteriological investigation. The opportunity did not arise until about nine months later, although many hundreds of patients passed through the eye wards during this period. As this third case presents one or two striking features, demonstrating macroscopically, as it did, the presence of gas-forming organisms in the cornea, and as I am able to submit a very complete bacteriological report from Major S. W. Patterson, R.A.M.C., it may be of interest if I record my observations in detail.

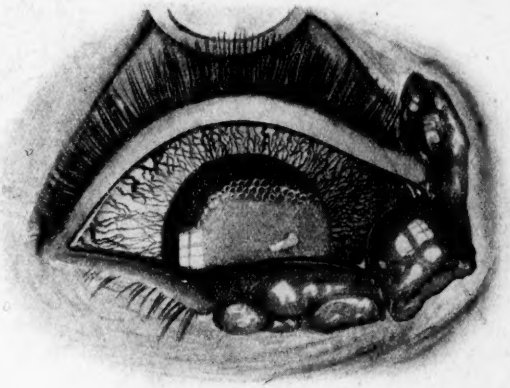
Pte. H. L., of the South Wales Borderers, aged 19, was admitted to the eye wards from convoy on May 1, 1918, having been wounded two days previously. The notes accompanying him on his field medical card from the Casualty Clearing Station, and dated the day he was wounded, were: Small wound of entry inner canthus right eye, globe apparently uninjured, haemorrhage nose and mouth, foreign body removed from in front of left tonsil; dry pack; stitch left in tongue. His condition on arrival was: Temperature 102° F., pulse 108, wound of entry at right inner canthus; packed; much swelling of right lids and right side of face and neck. Great chemosis of lower conjunctiva. Loss of inner half of lower lid and small portion of upper. Lower and inner third of cornea uncovered except by chemosed conjunctiva. Cornea bright, slight proptosis, and some limitation of movements of globe down and in. Tension of globe good. Vision=P.L. Some blood-stained discharge from right nostril. Mouth rather foul. The packing was removed from the wound, which was septic and foul smelling, and the track gently syringed through into the mouth with warm saline.

On May 2 the wound in the mouth had closed, and the entrance wound at the inner canthus was much cleaner. The temperature was still 102° F., and pulse 104, but his condition was good. I asked Captain Harty, the nose and throat specialist, to see the case, and he very kindly examined it for me. He reported a very long-standing ethmoiditis with hypertrophic rhinitis, and recommended nasal douching with saline and the use of collosol argentum afterwards.

By May 6 the patient's temperature had come down to normal and pulse to 80, and any danger of meningitis owing to a fracture

through the cribriform plate of the ethmoid was now at an end. The wound at the inner canthus was discharging freely, and, in spite of frequent bathings, the right eye was continually fouled by the discharge. The chemosis of the conjunctiva had, if anything, increased, and was now hiding the inner and lower half of the cornea, which had become slightly hazy. By means of adhesive strapping, the lower lid was held up in such a position as to cover the cornea. Atropin drops were ordered once a day, with 15 per cent. argyrol drops night and morning, along with frequent bathings with warm boric lotion.

Two days later an ulcer of the cornea developed over the lower and inner part, but there was very little infiltration of the corneal substance, and the ulcer looked remarkably clean and superficial.



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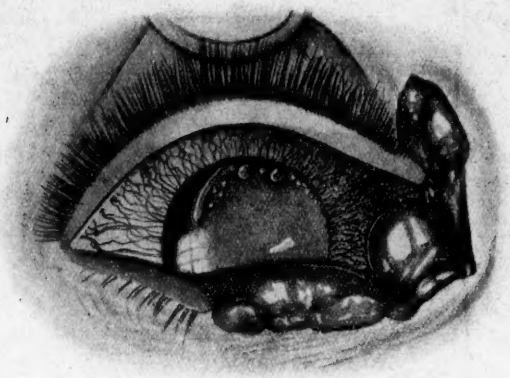
Next day the eye looked rather better and the ulcer had not increased in size, but when I saw the case about 10.45 o'clock on the following morning the whole appearance had changed. The upper outer conjunctiva, which up to this had shown only mild inflammatory reaction, was now intensely congested and slightly chemosed. The lower and inner two-thirds of the cornea had become completely opaque, looked swollen and oedematous, and was beginning to bulge forward at the site of the ulcer. Along the upper and outer edge of the infiltrated area a double row of minute bubbles of gas could be distinctly seen with the naked eye. These bubbles appeared to be in the superficial layers of the true cornea, and presented a very striking picture as they were hidden only by a slight haze of the intervening substance, while the cornea beyond them was almost clear. Half an hour later the bubbles had increased

in size and were spreading towards the upper and outer edge of the cornea, the infiltration spreading up with them and gradually involving the remaining clear part of the cornea. By 11.30 o'clock the whole cornea had become opaque, but a few bubbles could still



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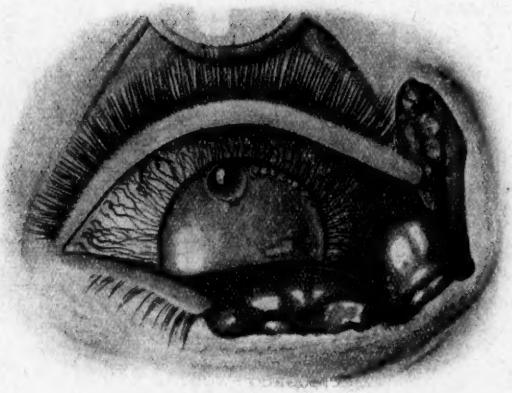

11.30

be seen along the upper edge, and while I was examining the eye, one of the larger bubbles burst on the surface. The bulge over the lower part was much more marked and the cornea looked as if it might give way at any moment. The eye was excised at 11.35.

Oberation.—After irrigating with normal saline, the cornea was

removed and the contents of the globe were carefully eviscerated. Except for a small mass of exudate which was found lying on the ciliary body to the outer side, the contents of the globe seemed healthy. The interior of the sclera was thoroughly irrigated with normal saline and the sclera then removed, a small collar being left round the nerve head. The socket was then swabbed out thoroughly with hydrogen peroxide, irrigated with normal saline, and a few drops of 15 per cent. argyrol were left in. A pad and bandage were applied for an hour, and the socket was then left uncovered. Irrigations with weak hydrogen peroxide were ordered three hourly, and a few drops of 15 per cent. argyrol were applied night and morning.

Next day the socket looked clean and there was no sign of gas, but the upper lid was rather swollen and red, and the conjunctiva still chemosed. The patient's general condition was excellent and he had no pain. On the following morning, as the upper lid was distinctly more swollen, three hourly fomentations were ordered and warm boric lotion was substituted for the hydrogen peroxide. In two days the swelling had disappeared and the socket was quite clean and healthy. On May 19 the patient was transferred to England.

The temperature chart showed no special point of interest, the temperature remaining practically normal from May 6 to May 19, except for a rise to 100·6° F. on the morning after the operation.

Laboratory report by Major S. W. Patterson, R.A.M.C.

Captain Pringle's eye specimen for gas organisms.

In situ the blurred cornea of the eye showed small gas bubbles as described above. After irrigating with saline solution, a glass capillary pipette was pushed into the corneal substance and a small amount of fluid obtained. Films of this fluid, when stained, showed no organisms, but cultures gave both streptococci and staphylococci. A small portion of gassy cornea was snipped off and dropped into a mince meat tube. After incubation, a growth was noted of streptococci, and staphylococci, diphtheroids, and numerous Gram-positive rods of varying lengths; there were a few bubbles of gas formed, and the meat was slowly digested; subculture after heating to 80° C. for 15 minutes showed subterminally sporing Gram-positive rods.

The purulent iris on culture gave streptococci and staphylococci; and cultures from the vitreous showed the same micro-organisms.

In sections, the cornea showed separation of the fibres by vacuoles, in the walls of which the corneal cell nuclei were proliferating; while at the surface and periphery of the cornea, the vacuoles also contained polymorph cells which had wandered in.

The sclera showed considerable engorgement, and in places extravasation of blood had occurred.

The micro-organisms found are, therefore, those usually met with in infected war wounds; i.e., streptococci and staphylococci, B. perfringens, and B. sporogenes. There were also a few forms suggestive of *vibrion septique*, but these last were not isolated in pure culture.

Remarks

One of the most striking features in these three cases was the rapid involvement of the cornea. In each it was only a matter of a few hours, while in the last case the upper third of the cornea became infiltrated in 45 minutes. I do not know of any other condition in which this occurs.

I was exceptionally fortunate in being able to observe the actual formation of the gas bubbles in the corneal substance in the last case. This, doubtless, occurred in the other two cases as well, but in them the condition had advanced so far that the bubbles were either hidden by the opaque cornea or had burst on the surface.

It would appear as though it were necessary to have some break in the corneal epithelium, and possibly in Bowman's membrane, before the gas organisms can gain access to the corneal substance. In my first two cases this break was caused by actual wounds of the cornea, and in the last case by an ulcer following exposure of the cornea. When wounds of the cornea occur, it is probable that the infection is carried in by the foreign body, but cases where an ulcer is the starting point of infection are more difficult to explain. My last case would lead one to believe that here the wounds of the soft parts round the eye are the seat of the primary infection, and that the organisms are carried into the conjunctival sac in the discharge from these wounds. Why the soft parts themselves do not become "gassy" is probably due to their excellent blood supply, as mentioned in the early part of this article.

It is unfortunate from the observer's point of view that in each case the eye was removed while the cornea alone was involved, as it would have been extremely interesting to note the spread of the infection. Major Patterson's report shows that only streptococci and staphylococci were isolated from the contents of the globe and that beyond inflammatory reaction the sclera showed no signs of actual gas infection. It is probable that the sclera would offer considerably more resistance to the development of gas organisms than the damaged cornea, which would explain the fact that I was able to remove the eye before this structure was involved. As streptococci and staphylococci were isolated from the iris and vitreous, infection had evidently spread through Descemet's membrane, which had become disorganized, into the interior of the globe, and whether or not the blood supply to the iris and ciliary body had anything to do with the barrier offered to the inroads of

the gas organisms in this direction, one can only conjecture. It was impossible at the time of the operation to obtain a specimen from the aqueous, as the cornea gave way as soon as the globe was touched.

The three drawings of the eye have been done for me by Sergt. Maxwell, R.A.M.C., from rough sketches made at the time, and I should like to take this opportunity of thanking him for the excellent way in which he has carried out the work. They give a very good idea of the appearance of the cornea at different stages, and also show the entrance wound at the inner canthus, and the masses of chemosed conjunctiva filling up the gap in the lower lid. In the first drawing the large area of opaque cornea is clearly seen, with the ulcer down and in, and the rows of bubbles slightly ahead of the advancing infiltration. The second drawing gives the appearance half an hour later, when the bubbles had run together, and the infiltration had spread further towards the upper edge of the cornea; whilst the last drawing shows the cornea completely opaque, with the large bubble at the upper edge, which burst as the sketch was being made.

A NEW TEST TYPE FOR THE DETECTION OF MALINGERERS IN ARMY WORK

BY

ALAN W. SICHEL, B.A., M.B., Ch.B. (Edin.)

CAPTAIN, R.A.M.C.

IN examining the visual acuity of men in the Army the ophthalmic surgeon has to contend with malingering, and in many cases the detection of a malingerer is a matter of some difficulty.

Out of 1,956 cases where the visual acuity was examined at No. — Ophthalmic Centre during a period of twelve months, 101 cases of malingering were recorded, representing about 5 per cent. of all eye cases seen.

By malingering in this connection is meant the refusal of men to admit having as high a visual acuity as they really possess, whether they be emmetropic or have an error of refraction small or moderate in amount.

Malingering in the Army differs from that met with by the oculist in civil practice in this respect; in the latter case the malingerer usually maintains that he is blind in one or both eyes, or at any rate that he has no useful vision in one or both eyes in order to claim compensation for an injury alleged to have been caused by his work. In Army work, on the other hand, the type of

malingerer met with is one who pretends that his vision, while fairly good, is below a certain standard. This is due to the fact that in classifying men as to their fitness for the various categories as regards visual acuity, certain standards are laid down, *e.g.*, to be fit for category A a man must see at least 6/24 with either eye without glasses and at least 6/12 with the right eye with glasses. In order to be rejected for category A, a man must maintain that he cannot see more than 6/36 with either eye without glasses, or that he cannot see more than 6/18 with the right eye with glasses.

Familiarity with the medical inspection room and the usual test type therein displayed, has enabled men to become acquainted with the card of letters. They know that the large letter (6/60) at the top indicates a low standard of vision and that the lowest line (6/6) means a high standard, the intermediate lines from above downwards representing increasingly higher standards. It may even be possible that some men get to know that the fifth line from the top (6/12) is the minimum standard required with glasses for category A.

Accordingly, it is found in examining the visual acuity that in many cases the larger lines are read with comparative ease, but nothing can induce the man to read more than 6/18, even though he be emmetropic, or, having an error of refraction, when this is corrected by glasses. In such cases, when the fundus and media are healthy and the eye is emmetropic or possesses an error of no great amount which is capable of correction, the examiner can only infer that the man ought to see more, and it is obviously a difficult matter to certify the vision to be up to standard when the man declares he cannot see as much as he is expected to. In order to detect cases of this kind, the writer has devised a test card which is intended to prevent the malingerer from judging the standard by the size of the type. The card consists of successive rows of letters constructed upon the usual principles, as in Snellen's test type, but the size of the individual letters varies in each row; thus, the top row consists of five letters which should be read at 9, 6, 12, 9, and 18 metres respectively, the second row of letters which should be read at 18, 12, 6, 9, and 24 metres, the third row of letters which should be read at 12, 18, 36, and 9 metres, and the bottom row of letters to be read at 24, 6, 12, 9, and 18 metres. The distance at which each letter should be read is indicated in small type above the letter. There is no letter of a size which should be read at 60 metres on the card, the largest being one read at 36 metres. In addition to the arrangement of the letters as described, the card employed is smaller in size than the ordinary test card, and this causes the letter to appear relatively larger. There are also four rows of type as compared with seven on the ordinary card.

On being confronted with a card of this kind, the man under examination regards the letter (36), being the largest seen, as equal

in size to the top letter (60) on the ordinary card. Starting on this erroneous assumption he is tempted to read letters throughout the successive rows one size smaller than he would otherwise have done. It is a matter of some difficulty, even for one accustomed to the ordinary test type, to tell at a glance whether an isolated letter is of a size to be read at 12 or 18 metres, or at 9 or 12 metres; therefore to a man not conversant with such types it is exceedingly difficult.

When the malingerer is asked to read the letters he can see, knowing that it would be foolish for him to say he cannot see even the big letters, he commences to read what he judges to be letters of an intermediate size. If he reads all the letters except those intended to be read at 6 and 9 metres, it is at once known that he can read 6/12 with the eye under examination and this is all that is required, the minimum standard for category A being 6/12 with glasses in the right eye.

What actually happens is, that the malingerer is absolutely bewildered by an arrangement of letters he has not seen before, and in his confusion he blunders into reading smaller letters than he would have done had he proceded from larger to smaller type.

It is important in using the new card that all ordinary test types should be hidden from view, or else the man is afforded an opportunity of comparing the sizes of the various letters with the type arranged in the manner to which he is accustomed.

It is not maintained that every malingerer can be caught in this way, as there is no known method of compelling a man who refuses to read any but the largest letter to admit he can read more, nor is the new card intended to take the place of any of the well known methods for detecting malingerers when these are called for; but after a sufficient trial it has been shown that the large majority of malingerers of this special kind can be detected.

In order to prove the efficiency of the new type, the following routine has been followed. The visual acuity was first recorded as shown by a test card of the ordinary kind. Objective examination in the dark room was then carried out and the refraction noted. The trial frame having been placed in position, the vision of each eye was tested with a plane glass, using the ordinary card. In a few cases the malingerer would read another line or two with the mere addition of a plane glass, but more often than not he still maintained that he could read only what he declared at first. The new test card was then exposed, all ordinary cards being out of sight. In the cases recorded the men were actually shown to have a higher visual acuity by the mere change of cards. The reverse method, i.e., testing first with the new card followed by an ordinary card, revealed the same difference.

In routine work the vision is recorded at the outset by means of the new card, in order that no opportunity may be afforded for

comparing the size of the type, i.e., judging the standard. In this way the actual visual acuity, or the nearest approximation to it, is obtained without loss of time, and with the minimum of trouble to the oculist, in all but a few cases of malingering.

The card has also proved of use in examining the vision of neurasthenic individuals who perhaps read as far as 6/12, and then say "the rest are blurred." On changing the old for the new type they may read 6/9 or even 6/6 without hesitation.

COUNCIL OF BRITISH OPHTHALMOLOGISTS

The Visual Requirements of Motor Drivers

A COMMITTEE appointed by the Council of British Ophthalmologists, to report on the visual requirements desirable for those who are granted licences to drive motor vehicles, is desirous of obtaining particulars as to the experience of motor drivers: (*a*) who are blind in or have lost one eye; (*b*) who habitually wear distance glasses.

In order that the Committee may base its report on as large an amount of evidence as possible, it requests the assistance of the readers of the BRITISH JOURNAL OF OPHTHALMOLOGY.

It would be glad to receive answers to the following questions* concerning motor drivers coming under either of the above categories. Such answers should be sent to the Hon. Sec. of the Committee, Mr. Elmore Brewerton, 73, Harley Street, W.

Motor Drivers who are blind in or have lost one eye

Initials: Age:

Which eye is lost or blind?

When was the sight lost or eye removed?

What is the condition of the sight in the other eye?

Had you driven a motor car before the loss of the eye, and, if so, for how long?

For how long and in what districts have you driven a motor car since the loss of the eye?

What kind of motor vehicle have you been driving?

Have you at any time, since the loss of the eye, collided with objects either moving or stationary?

If it is your right eye which is lost, have you experienced any difficulty with respect to:

(*a*) Traffic trying to overtake you.

*Copies of these questions can be obtained on application to MR. ELMORE BREWERTON, 73, Harley Street, W.1.

(*b*) Turning your vehicle to the off-side across incoming traffic.

(*c*) Traffic approaching you from a cross road on the off-side.

Have you experienced any difficulty in driving at night since the loss of the eye ?

Have you been inconvenienced whilst driving by getting a foreign body in the remaining sound eye ?

Do you find a mirror helps you in seeing on-coming traffic ?

Motor Drivers who habitually wear distance glasses

Initials : Age :

What is your degree of refractive error in each eye, and your vision with and without glasses ?

For how long have you been driving a motor car ?

What, if any, disabilities have you experienced from the use of glasses whilst driving, *e.g.*, from atmospheric conditions, or limitation of your field of vision ?

Have you at any time collided with objects either moving or stationary ?

Have you experienced any difficulty in driving at night, and do you prefer to do so with or without your glasses ?

ANNOTATIONS

Army Spectacle Depôt

Knowledge of what is known as the Army Spectacle Depôt does not appear to be so widely diffused as is desirable among the medical profession. In point of fact, the Depôt forms the centralized optical department of our forces at home and abroad. It was established in January, 1916, and since then has furnished 290,000 pairs of glasses to the troops, and as a result it has been computed that some 150,000 men have been placed in higher categories, and 80,000 men brought into the Army who would otherwise have been rejected. Printed instructions are issued to medical officers specifying the kinds of lenses provided by the Depôt and giving particulars required, and asking for details of the visual acuity with and without glasses, and of many other points that need not be specified. From one notice we gather that the frames of the spectacles issued by the Depôt are made of a shell

composition for use in climates where it is undesirable that metal should come in contact with the skin. They are more easily broken than if made of metal, but, on the other hand, they can be more readily adjusted to the soldier's face by softening the composition in warm water and by then moulding them with the finger to the desired shape. The straight sides of the frame are pierced by a small hole, so that if they become loose they can be readily fastened round the soldier's head. The necessary prescriptions and measurements for glasses are furnished by the different medical officers and transmitted to the Army Spectacle Depôt, which in due course supplies the spectacles. A word concerning the Depôt itself, which is at Clifford's Inn Hall, Fleet Street, E.C.4, where a staff of about 100 girls, superintended by Mr. J. H. Sutcliffe and assisted by three or four R.A.M.C. optical mechanics, have been trained in the various processes of turning out spectacles for the 200 ophthalmic centres established by the Army Medical Department at home and on the different fronts. We hope to publish before long a full account of the work from the pen of the Superintendent of the Army Spectacle Depôt.

Optometry in Ontario

Readers may recall the fact that we animadverted in these columns (August, 1918) on the proposals made by Mr. Justice Hodgins with regard to optometry in Ontario, Canada. We are now glad to observe that the Ontario Medical Association has expressed its views upon the subject (*Canada Lancet*, December, 1918). The Association protests against Mr. Justice Hodgins's proposal to create any sort of quasi-profession with just enough medical knowledge to prove dangerous to the public. There can be no objection to some provision in the legislation of the Province whereby all those outside the medical profession who do refraction work and prescribe glasses must first obtain a certificate of competency for such work from an accredited board. But beyond this the law should not go in the recognition of a separate body. Neither can the Association concur in Mr. Justice Hodgins's recommendation that the universities should provide additional courses of instruction. It thinks that a better plan would be to lay upon the universities the responsibility of furnishing to medical students a more extensive course on refraction than that at present given. This would tend to supersede the need for the optometrist. As to the Commissioner's three recommendations that the optometrist should be given (1) adequate knowledge of medicine to detect disease in the body disclosed or indicated by the eye, (2) acquaintance with the physiology and the pathology of the eye

adequate to recognize local disease, and (3) a thorough knowledge of practical optics and refraction, the Association holds that the clause last named is all that is required for opticians. The other clauses could be carried out only as part of a medical course. The medical colleges cannot arrange special courses for such purposes, nor can they fit optometrical students into the regular courses now in existence. To institute a special college for the purpose has all the objections of creating a quasi-profession and of multiplying the difficulties now existing rather than of simplifying them. While the Association approves of a good training for opticians, such as may be obtained from technical schools and from experienced opticians, it thinks that the logical solution of the optometrist difficulty would be met by urging a more thorough course of refraction in the medical colleges. With this view we are in cordial accord, and would merely add that, in our opinion, ophthalmology should form an integral part of the final examination for medical qualification.

ABSTRACTS

I.—ANISOCORIA

Tarun, William (Baltimore). — Pupillary studies, with special reference to anisocoria. *Trans. Amer. Ophthal. Soc.*, Vol. XV (1917), p. 301.

Tarun has investigated the frequency and diagnostic value of inequality of the pupils, and to this end has examined records of 3,610 private patients suffering from non-inflammatory affections of the eyes. Examinations were made in a dark room with a constant source of light. The reaction of the pupil was determined with a concave mirror, used at a distance of rather more than its focal distance. Anisocoria was looked for under the same conditions with a plane mirror, at a distance of one metre from the patient. In Tarun's opinion, the daylight test should be discarded. The examination of the pupils should be made under quiet conditions, in order to exclude the psychic reflex. Two minutes should be allowed for dark adaptation. The author feels sure that on occasion Haab's cortical pupillary reflex has been mistaken for an Argyll Robertson pupil. Anisocoria was found in 19·39 per cent. of the cases examined. Normal eyes averaged 18·54 per cent., which gradually rose in diseased eyes and lesions of the nervous system until 70 per cent. was reached in the instances of Argyll Robertson pupil. Tarun is rather sceptical in believing that there is such a condition as physiological anisocoria, although Bach and

Behr think it does exist. "In view of the percentage of anisocoria in the normal eyes there must have been some condition present, eliminating a toxin, during the lifetime of the individual, acting not upon the motor supply of the sphincter muscle of the iris, but upon the sympathetic fibres to the dilator pupillae." Tarun believes that inequality of the pupils is of scanty value when the pupils are active to light, when there is merely a slight difference in size, and even in some cases when a marked difference exists. When there is a slight difference in size, together with inactivity to light, directly or consensually, it is of the utmost value in determining the site of a lesion of the cerebro-spinal axis. It is useful at times when one pupil or both pupils are not uniformly round and sluggishly active.

The communication ends with a bibliography containing thirty-three entries.

S. S.

II.—TETANUS FOLLOWING INJURY OF THE EYEBALL

Sattler, Robert (Cincinnati).—Perforating injury limited to the eyeball followed by acute tetanus. *Trans. Amer. Ophth. Soc.*, Vol. XV (1917), page 234.

The eye of a man of 21 years was perforated by an improvised arrow made of weeds pulled out of the ground and discharged from a crossbow by a boy. The patient at once pulled the missile out of the eye. When seen thirteen hours later the entrance wound was found to be limited to the cornea, and to have mangled iris tissue and lens substance protruding through it. The wound was cleansed and the shreds of iris and lens were removed. Owing to the presence of threatening symptoms, the eye was removed the same day, twenty-four hours after the injury. All went well until the afternoon of the third day following the operation, when the man complained of difficult mastication and of stiffness of the muscles of the jaw. Large doses of antitetanic serum were given intravenously and intraspinally, the orbit was exenterated, and antitetanic serum was applied locally and injected into and along the sheath of the optic nerve. The patient died on the seventh day after admission. Autopsy disclosed congestion of the lungs, acute dilatation of the heart, fatty degeneration of the liver with passive congestion of the left lobe, acute splenic tumour, cloudiness of the meninges, and oedema of the brain. No bacteriological examination appears to have been made either before or after death. The injury seems to have been limited to the eyeball.

S. S.

III.—OCULAR DISEASE OF DENTAL ORIGIN

(1) **Hardy, William F. (St. Louis).—Ocular diseases of dental origin.** *Amer. Jl. of Ophthal.*, April, 1917.

(1) **Hardy's** article is a partial review of the literature of this subject accompanied by what appears to be a fairly complete bibliography. The following remarks towards the end of the article seem worthy of transcription :—

"The argument is raised that the connection between tooth and eye affections is too hypothetical and problematical, and that they are not related in cause and effect, but are coincidental. This view is based on the great prevalence of tooth affections and the relative infrequency of an associated eye disease. But the same is true of syphilis, gonorrhoea, and tuberculosis. How common are these and how relatively infrequent are ocular diseases the result of them. Yet no one disputes a syphilitic, gonorrhoeal or tuberculous iritis or keratitis. It is incumbent upon ophthalmologists to consider the teeth in our list of possible aetiological factors, but to refrain from making of this possibility a hobby to be ridden to death." These remarks seem very much to the point.

ERNEST THOMSON.

(2) **Dor, L. (Lyon).—Optic neuritis due to dental infection. (Névrite optique par infection d'origine dentaire.)** *La Clin. Ophtal.*, Sept. 1917.

(2) **Dor** has already given expression to his views on the subject of eye disease due to dental infection. He here adds reports of two cases which he holds are of this origin, though the case histories are incomplete in so far as the result of treatment of the teeth is not mentioned. He says that certainly readers are free to think that there is a simple coincidence between ocular affections of an "indeterminate" nature and the dental affection, but that those who consider the evolution of such cases of optic neuritis before and after the extraction of the teeth will quickly be convinced of the relation of cause and effect.

ERNEST THOMSON.

(3) **Dor, L. (Lyon).—Thrombosis of the retinal veins due to dental infection. (Thrombose des veines rétiniennes par infection d'origine dentaire.)** *La Clin. Ophtal.*, Sept. 1917.

(3) **Dor** relates the case of a soldier who had thrombosis of the central vessels of the right eye with retinal haemorrhages and amblyopia ex anopsia of the highly myopic left eye. There was neither sugar nor albumin in the urine and no sign of syphilis. The dental condition was very bad on the side corresponding to the thrombosis. Four teeth with infected roots were extracted

from this side of the upper jaw. The case is incomplete in so far as there are no observations as to the result, but Dor himself is satisfied as to the cause of the thrombosis being purely dental.

ERNEST THOMSON.

IV.—ICTERO-HAEMORRHAGIC SPIROCHAETOSIS

(1) **van Schevensteen (Belgian Army). — A case of retino-choroidal complications, associated with an attack of ictero-haemorrhagic spirochaetosis. (Un cas de complications rétino-choroidiennes à l'occasion d'une atteinte de spirochétose ictéro-hémorragique.)** *Ann. d'Ocul.*, December, 1917.

(1) **van Schevensteen** reports a case of choroido-retinitis observed during convalescence in a soldier affected with ictero-haemorrhagic spirochaetosis. The disease developed on November 17, 1916, the symptoms being of moderate severity. On December 18, 1916, the eyes were examined, and vision was found to be 1·0. As regards the left eye, there was retinal anaemia. The urine contained traces of blood and albumin, some white corpuscles, many renal cells, but no spirochaetes. 4·c.cm. of venous blood was injected into the peritoneum of a guinea-pig, and was followed by jaundice. A small number of spirochaetes were found in the animal's liver and suprarenal capsules, but none in the kidneys. The patient was sent to his dépôt, on January 10, 1917, and sixteen days later he complained of his left eye, and albumin was found in the urine.

On March 10, 1917, R.V.=1·1. Fundus normal. L.V.=0·8. Floating bodies in vitreous. The urine contained albumin, but was free from spirochaetes. On March 23, the vision of each eye was 1·1. The right eye was free from changes, but the left showed vitreous opacities (filaments). On April 5, the patient complained of some slight disturbance of the sight of his right eye, and on examination, the vitreous was found to be somewhat cloudy. V.=1·0. L.V.=1·0. Condition of vitreous as reported. On May 23, a patch of recent choroido-retinitis was discovered in the periphery of the right fundus, and on May 30, a similar discovery was made in the left fundus. On June 25, R.V.=0.8 ; a few small haemorrhages were found about the diseased area in the fundus. L.V. 1·1. The area of choroido-retinitis was unaltered. The vitreous opacities had disappeared. On July 15, when the patient was discharged, the urine contained no albumin. R.V.=1·1. L.V.=1·1. There were no vitreous opacities, and the areas of choroido-retinitis were in process of resolution.

Incidentally, van Schevensteen mentions two other cases of spirochaetosis. In one, there were a couple of crises of intense neuralgia, lasting for two or three days, affecting the supra- and infra-orbital nerves on the left side, and accompanied by photophobia and moderate lacrymation. In a second, convalescent, violent pain around and in the eyes was complained of, and in one eye signs of past iritis were found on the anterior capsule of the lens. No albumin in the urine. S. S.

(2) **Weekers, L. and Firket, J. (Belgian Army).—Redness of the eye in ictero-haemorrhagic spirochaetosis. (La rougeur oculaire dans la spirochétose ictéro-hémorragique.)** *Arch. Méd. belges*, April, 1918.

(2) It is well known that hyperaemia of the anterior segment of the eyeball is an early sign seldom absent from cases of ictero-haemorrhagic spirochaetosis. For example, it was present in 92 per cent. of the cases examined by **Weekers** and **Firket** (see this Journal, March, 1918, p. 141). Those authors discuss that manifestation more particularly in the present communication. They note that the congestion of the conjunctiva is secondary to a more or less pronounced ciliary congestion, which betrays the localization of the causal spirochaete in the uvea. The spirochaetes have been found in the blood and the cerebro-spinal fluid, as well as in the liver and kidney, and we need not be surprised that they become fixed in so vascular a tissue as the uvea. Hyperaemia of the anterior segment of the eye, congestion of the iris, and iritis are manifestations of different degrees of inflammation of the uveal tract. The redness of the front of the eye may be discrete, but in more marked cases the parts are vividly injected and sometimes intense reactional symptoms may be observed, as photophobia, watering, redness of the eyelids, etc. When examined closely the redness is seen to involve both the conjunctival and the ciliary vascular system. Subjective symptoms, as a rule, are but slight. The patient sometimes complains of no pain, although more often he experiences a pricking sensation and moderate pain, spontaneously or on pressure. Moderate lacrymation is the rule. Traces of secretion may be found, but it is scanty and does not agglutinate the eyelids during sleep. Simple cases call for no treatment beyond the use of a cleansing lotion. In some instances hyperaemia of the anterior segment gives place to congestion of the iris, as recognized by pupillary inequality or contraction, showing that the congestion is not equally marked in the two eyes. The ocular complication may or may not coincide with an elevation of temperature. In grave cases there may be all the symptoms of iritis or even of irido-cyclitis. In these forms atropin and other remedies employed in iritis should be used.

S. S.

(3) **Noff, P. and Firket, J. (Belgian Army).—Clinical observations upon one hundred cases of ictero-haemorrhagic spirochaetosis. (Observations cliniques sur cent cas de spirochétose ictéro-hémorragique.)** *Arch. Méd. belges*, April, 1918.

(3) In the course of this communication by **Noff** and **Firket**, based upon the clinical observation of 100 cases of ictero-haemorrhagic spirochaetosis, the writers incidentally allude to the accompanying eye complications. In the early stages conjunctival and ciliary redness is the rule, and the patient complains of lively pain during extended movements of the eyeball, especially upwards or to the side. When the haemorrhagic element is pronounced subconjunctival ecchymoses are common. Towards the fifth or sixth day, exceptionally on the fourth, the conjunctiva becomes jaundiced.

S. S.

V.—REMEDIES

(1) **Cavara (Siena).—On the specific optochin therapy of pneumococcal infections of the cornea. (Ueber die spezifische Optochintherapie der Pneumokokken-infektionen der Hornhaut.)** *Klin. Monatsbl. f. Augenheilk*, June, 1915, p. 601.

(1) This exhaustive paper by **Cavara**, extending to over 60 pages of the *Klinische Monatsblätter*, is too long to abstract in detail. The introduction deals with the chemical constitution of ethylhydrocuprein or optochin and with the literature. The second part deals with the bactericidal action of optochin, showing that *in vitro* its action is specially efficient in respect of the pneumococcus.

In the third part the action of optochin on the ocular tissues, especially the cornea, is discussed. A 1 per cent. to 2 per cent. solution may be used hourly as a drop without damaging the cornea, and the ulcer may be touched with a 2 per cent. to 5 per cent. solution. As a result of its anaesthetic action, only the first application of the 1 per cent. solution causes "a more or less strong burning," subsequent applications are practically painless. In respect to stimulating the healing of a corneal wound with loss of tissue, optochin was found to be indifierent or slightly positive. Intra-ocular pressure is uninfluenced or slightly reduced. The fifth and longest section deals with the results of treatment of ulcus serpens corneae by optochin. Fifty-five cases are recorded. Cavara used exclusively a 1 per cent. to 2 per cent. watery solution of optochin hydrochloride which was applied hourly for half to one minute on each occasion.

When the deeper corneal layers are infected, it is necessary to apply the solution at very short intervals during the night also. In pneumococcal ulcers the results are always favourable.

The sixth and last section deals with the action of the solution in cases complicated by dacryocystitis. Here it was found that the condition of the lacrymal sac had no unfavourable influence on the corneal ulcer, and that the treatment of the latter by optochin caused pneumococci to disappear from the secretion of the sac.

The author concludes strongly in favour of this method of treatment of corneal ulcers which have been shown to be pneumococcal.

H. M. TRAQUAIR.

(2) **Stengele (Bremen).—On the use of optochin in various external diseases of the eye. (Ueber die Anwendung von Optochin bei verschiedenen ausseren Augenerkrankungen.)** *Klin. Monatsbl. f. Augenheilk.*, April-May, 1915, p. 446.

(2) **Stengele** has used optochin in three types of cases: those caused by pneumococci; diseases of the tear-sac; and conditions especially characterized by photophobia. Details of twenty cases are given and the author's conclusions are strongly favourable. A 1 per cent. solution used *regularly* every one to two hours was found to cure hypopyon ulcers, and a 5 per cent. solution after a few applications rapidly and permanently cured photophobia in scrofulous ophthalmia. In cases with lid eczema, however, the results were not good until the lids were improved by ointments. In photophobia due to interstitial keratitis and to irritation by lime, optochin was not successful. Optochin seems hardly likely to become a popular drug as, while a 1 per cent. solution can be borne without cocain, a 5 per cent. solution is found "very unpleasant." The evidence of its usefulness brought forward in this paper is not very convincing.

H. M. TRAQUAIR.

(3) **Basterra (Santa Cruz).—Therapeutic value of ethylhydrocupreine in ophthalmology. (Valor terapeutico de la etilhidrocupreina en oftalmologia.)** *Archivos de Oftal. Hisp. Americ.*, December, 1917.

(3) **Basterra** has obtained good results in cases of serpent ulcerations with the use of ethylhydrocupreine (optochin). His conclusions are as follows: optochin is the best form of treatment we possess for pneumococcal serpent ulcer of the cornea; rapid healing with a minimum of bad after-effects follows its use. The scars which remain are finer and less dense than those left after other methods of treatment. The drug is to be employed two hourly in 2 per cent. solution; after previous cocain anaesthetisation of the cornea, until the corneal infiltration has disappeared,

and the ulcer has begun to cicatrize. Finally, to facilitate the action of the drug, the mucocele, when present, must be extirpated.

R. R. JAMES.

(4) **Seidel, E. (Heidelberg).—Light treatment in eye disease. (Zur Frage der Lichtbehandlung von Augenleiden.)** *Arch. f. Ophthal.*, Vol. XCIII, Part iii, 1917.

(4) **Seidel** alludes to the work of Koeppe and Schanz on the treatment of tuberculous eye diseases by light therapy. The former used a Nernst lamp with Gullstrand's apparatus, and the latter an arc lamp filtered through dark blue glass. The results obtained were satisfactory. Other authors (Rollier, Flemming, and Krusius) had obtained equal, if not better, results with direct sunlight. Seidel was led to try direct sunlight in several tuberculous eye cases and was very well satisfied with the results obtained. He quotes at some length the notes of a private case of Wagenmann's of nodular tuberculous iritis in which, in spite of energetic use of all the ordinary methods of treatment, including tuberculin, the condition got steadily worse. After a fortnight's light treatment the nodules had practically disappeared and the condition had improved to such an extent that the patient was discharged a fortnight later.

The method he has adopted of using sunlight consists in shielding the eye with a black card in which is pierced a hole 2 mm. in diameter through which a narrow pencil of sunlight is directed to the affected part. At first the light is allowed to act for half a minute at a time and later for two minutes. If the sun permits the treatment is given daily. In the case quoted above 15 light treatments were given. He has observed no ill-effects.

E. E. H.

VI.—THE CHOICE OF OPERATION IN GLAUCOMA

van der Hoeve, J. (Groningen, Holland).—Defects in the visual fields and operation methods in glaucoma. (Gesichtsfelddefekte und Operationsmethoden bei Glaukom.) *Zeitschr. f. Augenheilk.*, Vol. XXXIV, Parts 4-6, 1915.

van der Hoeve has written a paper which should be studied by all ophthalmic surgeons. He shows how absolutely essential it is in all cases of glaucoma carefully to search for scotomata in the neighbourhood of the blind spot. As soon as Lagrange showed how to attain the long-desired filtering scar, sclerectomy conquered the ophthalmic world. At the present time there must be very few eye clinics which do not employ one or other of the methods in vogue for obtaining the fistulous cicatrix, and at one time it almost appeared

that iridectomy had lost its place of honour among the glaucoma operations. The inevitable reaction has taken place, because it is now fully realised that a late infection may destroy or seriously damage the eye after sclerectomy. It is, however, as unjustifiable to place the operation first among glaucoma methods, as it is to talk of the "tragedy of sclerectomy," as T. Harrison Butler* has done in a paper in which he says that "a sword of Damocles hangs over the head of every possessor of a filtering scar." We can definitely say that sclerectomy is a valuable addition to our methods of fighting the disease.

Bjerrum's method has a great advantage over ordinary perimetry; a scotoma is projected thirty-six times its real size, instead of only six times. Bjerrum stated definitely that one of the first signs of glaucoma was the appearance of a crescentic or ring scotoma, which, starting from the blind spot, swept round the fixation spot, and ended blindly upon the horizontal meridian. Bjerrum was inclined to believe that the characteristic scotoma was present in every case of chronic glaucoma. Priestley Smith went even further, and stated that if Bjerrum's sign were absent, glaucoma could almost certainly be excluded. In Germany, although similar scotomata had been occasionally described, even before Bjerrum pointed out their significance, the sign met with scant recognition; but even in that country, late in the day, it has proved acceptable.

Bjerrum early recognized the cause of the peculiar form of the scotoma, a defect in the nerve fibres, where these bundles end at the horizontal raphé of the retina. The scotoma, therefore, must end blindly in the horizontal meridian through the fixation point. If the nerve bundle defect stretches to the periphery of the retina, a sectional defect is added to the crescentic object, and the scotoma reaches from the blind spot to the periphery. The horizontal boundary of the scotoma gives rise to Rönne's nasal step (*nasale Sprung*).

The commonest extension of Bjerrum's scotoma is towards the periphery, which it either reaches independently, or it merges with a peripheral limitation of the general field of vision. Some of the cases given by van der Hoeve show, however, that the extensions of the scotomata may take place in another direction, towards the fixation point. This is a much more dangerous development, for the scotoma now threatens the macula.

van der Hoeve's first case may be summarized by saying that it was one of glaucoma simplex with a blind left eye, the right eye having a normal field of vision and almost normal acuity. There was, however, a scotoma which, although at first relative, slowly became absolute; a scotoma which, starting from the blind spot,

* Butler, T. Harrison.—The *Ophthalmoscope*, September, 1915.

extended in a crescent below the fixation point to the raphé of the retina. Above, a similar scotoma developed, which also slowly became absolute. The lower scotoma approached to within 1° of the fixation point. Some intervention was necessary. Miotics and sclerotomy failed to inhibit the spread of the defect. Iridectomy was rejected as too dangerous, because it is well known that it often causes an extension of the defect in the field of vision, and it is therefore customary to avoid this operation when the contraction is too near the point of fixation. Straub states that the danger zone is anything within 10° of the fixation point. In this case, therefore, there could be no question of iridectomy, and so sclerectomy was chosen. This was carried out by Elliot's method, with a very small peripheral iridectomy. During the last year the disease has not progressed, a small relative island has appeared in the absolute scotoma, and both scotomata have diminished in extent.

In the second case an eye with a fairly good peripheral field and good acuity was threatened with blindness by a central scotoma. The history of the patient shows how necessary it is regularly to watch the progress of the central scotoma. This is generally done by filling the scotoma in on a diagram. There is a scale of degrees upon Bjerrum's screen, but to use it, it is necessary always to employ the same fixation point, the centre of the scale of degrees. van der Hoeve uses a plain screen which he projects upon a diagram by means of a camera obscura, and so draws the scotoma upon a small scale. It is not clear whether the scotoma is first drawn full size upon Bjerrum's screen, and then projected upon the diagram or whether the moving object is also projected, and the scotoma drawn direct. We gather, however, that the former method is employed, but we are not told how the original is made; perhaps with white chalk upon a matt black paper.

If a Bjerrum's scotoma be not detected, there is a danger: first, that a man with good acuity and peripheral field may be lightly dismissed with miotics, until suddenly complete central blindness, rapidly followed by amaurosis, develops; and, secondly, one may imagine that the field is normal, and perform iridectomy, which, by increasing the central scotoma, destroys vision. Such cases are common in glaucoma records. Although the extension of Bjerrum's scotoma towards the blind spot is not the rule, it is probably not a rare occurrence.

In the third case a central scotoma threatened blindness to both eyes with good acuity and a peripheral field which was normal on the right side. The patient refused operation because of her good vision, and only consented to trephining when her acuity showed signs of failure.

In the fourth case the patient was blind of one eye, and despite

anterior sclerotomy, the vision of the other eye continued to fail, and the scotoma reached within 2° of the fixation point. After trephining, the field of vision enlarged 10°.

Case V.—Mrs. V., aged 63 years, first seen on May 28, 1914, complained that she had seen badly with the left eye for three months. R.V.=6/6; fundus normal. T. 25 mm. L.V.=6/18, T. 45-50 mm. Excavation with a circumscribed depression to 11D. Left field of vision contracted on the nasal side; left Bjerrum's scotoma. June 3.—Trephined above with small iridectomy. After this, the eye remained quiet. V.=6/24; T. 12 mm. Scotoma smaller.

Case VI.—B. B., aged 55 years, first seen on July 8, 1915. Seeing badly with both eyes. The sight of the left was always less acute than the right. R.V.=6/36. T. 33 mm. L.V.=2/60. T. 33 mm. The left cornea shows maculae, the right nebula. Deeply cupped disc in right eye (5 D.). Left disc excavated to 3 D. Right field of vision contracted. Bjerrum's scotoma. August 8.—Right eye trephined. July 25.—Left eye trephined. Both trephined above with small peripheral iridectomy.

From the time these operations were performed, the eyes remained quiet. R.V.=6/24. L.V.=6/60. Field of vision of left eye as before. In the case of the left eye, although the tension was reduced to less than 10 mm., yet the glaucomatous process was not arrested. For after an ephemeral enlargement of the field of vision, it slowly contracted up to a narrow temporal strip. No other cause for the contraction of the field, as in Elliot's case,* could be discovered.

All the patients after operation showed good filtration, and the so-called "Elliot" or "Herbert sign" was always positive; that is to say, the pressure of a probe left a pit in the conjunctiva. In the author's opinion the method cannot be used as a test of good filtration.

A consideration of the foregoing cases shows that Bjerrum's scotoma may begin as a relative defect for white, and that the power of perception in such a region may gradually diminish until absolutely blind islands appear, and eventually the whole area is blind. The author has also noted that crescentic scotomata generally start from the blind spot, or are best developed there, and also that they can spread from the raphé. This latter phenomenon is not surprising if the nerve fibre lesion be caused by increased pressure upon the fibres. It is obviously not to be expected that the fibres which end near the papilla will be the first to be destroyed; it is also possible that those which end in the raphé or in the middle may be more seriously or earlier affected. The consequence will be that relative or absolute scotomata will appear which do not

*Elliot.—The Aetiology of Glaucoma, The *Ophthalmoscope*, January, 1915, p. 7.

directly join the blind spot. Such partial defects which do not join the blind spot appear, indeed, in other diseases, as, for example, in retino-choroiditis. The scotomata, especially recent ones, may disappear after operation. Further, the scotomata which may or may not be accompanied by peripheral contraction of the field may increase and spread towards the fixation point; this progression is not always inhibited by miotics and anterior sclerotomy, although sclerotomy may lead to improvement; and sclerectomy by Elliot's method, with a small peripheral iridectomy, has no greater dangers in the case of large scotomata quite close to the macula or in well marked peripheral contractions.

Conclusions

1. Bjerrum's crescentic scotomata may be partially or wholly relative. They generally arise from the blind spot, but may also commence in another part of the arc. They are mostly best developed at the blind spot, but may be more decidedly evident in other situations. Decompression operations may cause them to disappear entirely or partially, or become relative again. This recession is not always detected last at the blind spot.

2. Every case in which there is any suspicion of glaucoma, even those with normal acuity and full field, must be tested for Bjerrum's and Seidel's scotomata.

3. Glaucoma patients should be treated with miotics or sclerotomy only when they are under constant supervision, in order that action may be taken at once should alarming symptoms supervene.

4. Contraction of the fields and Bjerrum's scotomata even to close to the fixation point are not contra-indications to Elliot's trephining. Therefore, this operation is especially suited for such cases.

T. HARRISON BUTLER.

VII.—NIGHT-BLINDNESS

(1) **Birch-Hirschfeld, A.—Night-blindness in warfare.** (**Ueber Nachtblindheit im Kriege.**) *Arch. f. Ophthal.*, Vol. XCII, Pt. iii, 1916.

(1) **Birch-Hirschfeld** has written a long and careful account of the numerous cases of night-blindness that have come under his care in the present war. He begins with a review of previous work and methods of investigation, and describes his own methods in detail. He has devised a simple form of lamp in which the test plate consists of five holes in a black card, evenly illuminated from behind, and in which the amount of light can be controlled by resistances, and also by the interposition of a photographic plate,

which shades from complete opacity at one extremity to clear glass at the other. The holes are 4 mm. in diameter, and are arranged in the form of a square with one hole in the centre. The square has a side of 3 cm. long. This arrangement is adapted for testing at 30 cm., so that the retinal image of one point is 0·2 mm. and should by accurate fixation fall on a rod-free portion of the retina, while the whole square occupies a retinal area of 15 mm.

His conclusions are as follows:—

In his military cases he found that in 77·8 per cent. there was a previous history of defective night vision. In 52·1 per cent. the ophthalmoscopic picture was normal. In 10·3 per cent. there was defective pigmentation, and in 39·3 per cent. the pigmentation was excessive. The refraction was emmetropic in 34·2 per cent., low myopia in 23·9 per cent., myopia over 6D. in 19·7 per cent., hypermetropia in 12·8 per cent., and astigmatism in 9·4 per cent.

Hereditary influences were frequent (more than a third of the cases).

Visual acuity was normal in 16·2 per cent., moderately reduced in 25·3 per cent., and greatly reduced in 12·8 per cent.

The majority (81·2 per cent.) had blue or green irides, only 18·8 per cent. had dark ones. As the author points out, this discrepancy may be accounted for by the greater number of light coloured irides in the army, and does not necessarily imply that such eyes are more liable to the affection.

Among the 22·2 per cent. of cases that had developed during the war, 6·per cent. were after wounds, 2·6 per cent. after bowel disease, and 2·6 per cent. after dazzling. 9·4 per cent. of these were observed for a considerable period, and of these 6 per cent. showed improvement. Amongst the remaining 86·4 per cent. which were previously affected, only 2·2 per cent. showed any appreciable improvement.

The visual field was concentrically contracted, especially in the older cases, markedly for blue and under reduced illumination.

Central vision in diminished light was greatly reduced in comparison with normal eyes. Specially noteworthy was the reduction of the blue sensation with reduced light.

In several cases the duration of after-images from dazzling was greatly lessened. A large number of the cases showed great susceptibility to bright light.

Investigation of the threshold stimulus and the dark adaptation rate gave very interesting results. Birch-Hirschfeld was able to differentiate three main types: type 1, threshold stimulus point raised, adaptation not at all or only slightly altered; type 2, threshold stimulus about normal, adaptation conspicuously altered; type 3, threshold stimulus raised and adaptation also interfered with. 23.9 per cent. were of the first type, 13.7 per cent. of the second, and

62.4 per cent. of the third. Cases with ophthalmoscopic changes and diminished central vision were mostly of the third type.

The author considers that the cause of night-blindness is to be sought in functional defect of the retinal apparatus concerned with dark adaptation which is often congenital. As predisposing or determining causes various defects of nutrition, loss of blood, fatigue, etc., as also those more direct effects on the retina produced by dazzling, certain toxic and autotoxic poisons, and the stretching of the posterior pole of the eye that takes place in high myopia. Several of these causes commonly work together.

In milder degress of the affection (stimulus perceptibility in darkness not less than one-third normal) and in which the visual acuity is good, field service need not be forbidden. In more severe cases even satisfactory garrison duty may be impossible.

Night-blindness sufficient to exempt from service seldom comes into question and requires careful confirmation.

The prognosis as regards improvement is better in recent cases than in those of longer duration, and best in the seldom seen acute forms, especially of epidemic form, which, however, the author has found rare in his military experience.

Treatment consists in improvement of the general body condition and protection of the eyes from dazzling.

A bibliography of German literature on the subject follows the paper.

E. E. H.

(2) **Augstein, C. (Bromberg).—Further war experiences of night-blindness and the (associated) fundus. (Weitere kriegsärztliche Erfahrungen über Hemeralopie und Augenhintergrund.)** *Klin. Monatsbl. f. Augenheilk.*, Vol. LVII, September-October, 1916.

(2) Since his publication on the subject in 1915 (*Klin. Monatsbl. f. Augenheilk.*, Bd. XV, p. 474) **Augstein** has had 63 cases more of night-blindness which he has investigated fully. They go to confirm the views he put forward then, and to throw more light on the affection.

He classifies the cases into three groups. The first group: The whitish-grey fundus (*der weissgraue Fundus*), characterized by a remarkable veil-like white striping which accompanies the large vessels to a considerable extent, besides the whitish-grey colouration which stretches from the papilla towards the region of the macula.

The second group: in the periphery—deep black flecks, thick black streaks, white spots and stripes, depigmentation often in triangular form are distinctive of the fundus.

The third group: greyish-white stripes in the periphery, larger or smaller decolourised patches often surrounded by light or dark greyish-black pigment, and simple depigmentation.

After critical estimation of all the findings in the first group, Augstein feels certain that the whitish-grey fundus has a distinctive significance as regards night-blindness. He thinks it highly improbable that there could be a case of whitish-grey fundus with normal vision for the luminous dial (*Leuchtuhr*). The occurrence of ring scotomata in two cases with pronounced hereditary night-blindness; in one case congenital amblyopia in one eye; in another, extreme night-blindness, with congenital amblyopia in one eye, and associated with the whitish-grey fundus on both sides, the presence of fine pigment here and there in the form of streaks; bilateral nasal conus with anisometropia in a third; the marked diminution of vision in one case; the extraordinary pronounced hereditary night-blindness without ring scotoma in two cases. The relatively high, but yet limited power of adaptation in one instance—all these lead to the conclusion that the whitish-grey fundus concerns the most varied gradations of an anomaly of the retina that in derangement of function manifests a resemblance to retinitis pigmentosa and retinitis punctata albescens.

As regards the nature of the whitish-grey fundus, Augstein has hardly any doubt that it is due to a peculiar kind of decolourisation of the pigment epithelium. This distinctive background presents the most varied gradations between the grey striation in the neighbourhood of the papilla and along the main vessels frequently seen in normal fundi to denote the course of the nerve fibres, and the extremely marked cases pictured in some of his figures. He has not yet concluded his investigation as to the frequency of occurrence of this fundus in the two sexes and at different ages. It appears probable to him that with the advance of age the development of pigment epithelium wanes. Those extreme cases which, owing to hereditary night-blindness and ring scotoma, present a pre-stadium (*Vorstufe*) to *retinitis pigmentosa sine pigmento*, require histological examination (to establish their relationship to the latter).

As regards the second group, he thinks that the fundus appearances have nothing to do with inflammatory diseases, and that one has to assume an emigration of pigment, due to repeated strong illumination of the eye, to explain the pigment collection in spots and streaks. As an exception, ring scotoma can occur in extreme cases of this group.

There is no new finding concerning the third group.

The account he gives of an epidemic of acute night-blindness due to exposure of the eye to intense light (*Blendungshemeralopie*) is very interesting. Of 100 Russian Mahomedan prisoners of war working on the estate "Pawlowken," 31 became affected with night-blindness. Of these cases, 22 had the whitish-grey fundus, 7 showed depigmentation in the periphery, and in 2 cases there

was no change discoverable in the background. They were all extremely well nourished. The improvement after 72 hours' confinement in utter darkness was prompt in every case, so that the patient could get about unaided in the dark, although normal adaptation had not been recovered by any of them. They were all given dark-grey protecting glasses to wear, and further improvement set in by degrees. Of the 69 unaffected Mahomedans who worked and lived under the same conditions as the 31 affected, 59 were available for examination, with the remarkable result that in 40 of them the "fundus hemeralopicus" was altogether out of the question; in 11 the hemeralopic fundus was present: eight times the whitish-grey fundus and thrice the fundus of the third group. Of these 11 cases, 9 became hemeralopic later and 2 remained unaffected during the period of observation. The fundus of the second group was never met with in any of these patients. The study of this epidemic forms a valuable support, according to the author, to the correctness of his view of night-blindness. In none of the cases was any considerable error of refraction evident, although, owing to the language difficulty, it was not practicable to take the exact vision, and charting the vision was out of the question altogether.

The following are the conclusions he arrives at: "If out of 173 cases, in only 3 cases no fundus change was discoverable, it is presumable that it is a rare occurrence, to a certain extent an exception. Further, in night-blindness there are changes in the pigment epithelium in typical form constituting the "fundus hemeralopicus." External injurious influences of the most varied kind could cause a deficient regeneration of the visual purple to make itself manifest eventually as night-blindness, while there was already present for a long time, if not always, deficient power of adaptation."

The question of therapy comes in only in the case of night-blindness due to undue exposure of the eyes to strong light (*Blendungs-hemeralopie*); here a three days' confinement to the dark (*Dunkelkur*) appears to have good effect; protecting glasses are also useful later. The luminous dial (*Leuchtuhr*) gives results which, although not of any scientific value, are certainly of practical utility, and could even take the front rank in practical examination. In the future its results must be compared with those of apparatuses for examining adaptation, as were described by Wessely and Crzellitzer in the Budapest War Sitting; in particular, Crzellitzer's apparatus appears suited to estimate very exactly the degree of the power of adaptation (in "Mikrolux").

There are five figures: four in colour in plates III. and IV. and one in black and white in the text, illustrative of the "fundus hemeralopicus."

D. V. GIRI.

(3) **Dehogues (Habana). — True night-blindness in Cuba, especially in the charcoal burners. (La hemeralopia esencial en Cuba, especialmente en los fabricantes de carbon.)** *Archivos de Oftalmologia Hispano-Americanos*, August, 1917.

(3) The author finds that true night-blindness is rare in Cuba, notwithstanding what might be expected to the contrary from its geographical position in the torrid zone, where the glare is intense. He has only met with records of 60 cases in more than 20,000 patients.

He draws attention to the night-blindness met with in charcoal burners, and has been allowed to give a short description of how this industry is worked in Cuba. His description is as follows: "In the neighbourhood of a forest where the green guava and other timber is abundant, the firewood cutting *(corte de leña)* is established; the fragments of the trees are grouped in the form of a cone, and completely encompassed with earth, leaving the summit of the cone of wood and earth free. The wood is fired and combustion is effected slowly. The smoke escapes through the summit of the cone and is circulated by the breeze into the surrounding atmosphere. The charcoal burners build their huts in close proximity to these kilns, and pass all their time in the neighbourhood. Should the atmosphere be calm and the breezes fail, the smoke instead of circulating falls to the level of their huts, and the charcoal burners are constantly breathing it. It is estimated that the composition of the smoke is almost completely pure carbon dioxide.

Charcoal burners are especially liable to night-blindness during the months of August to November. Examination of the blood in cases affected with this condition, proves a marked diminution in the haemoglobin. Patients were treated with tonics and kept in a subdued light. The blood, examined at the end of five days, was found to be normal as to the haemoglobin, and the night-blindness disappeared.

Ophthalmoscopic examination was always made with scrupulous care, and the fundus in every case was found to be healthy. The fields showed no contraction. The night-blindness varied in amount in different cases, some were incapacitated completely by it. Relapses were by no means infrequent on returning to work.

A series of ten cases of night-blindness in charcoal burners is appended.

R. R. JAMES.

(4) **Landolt, Marc.—Defective nocturnal vision among soldiers. (Les troubles de la vision nocturne chez les soldats.)** *Arch. d'Ophtal.*, July-August, 1917.

(4) This is a painstaking report, extending to no less than 26 pages.

of an investigation of night-blindness among men of the French Army.

The author begins by distinguishing three degrees of darkness: (1) dusk, (2) black night, an exaggeration of dusk, (3) clear night, with sufficient luminosity for the normal eye to have very good visual acuity. He groups his cases thus:

I. Men whose diurnal visual acuity is below normal, including (*a*) men with fundus lesions, (*b*) men with corneal lesions, (*c*) ametropes, uncorrected or badly corrected.

II. Men possessing normal diurnal visual acuity, including (*a*) corrected ametropes, (*b*) men in whom night-blindness is associated with dyscrasia of sorts, *e.g.*, that resulting from insufficient food, (*c*) cases of night-blindness of nervous origin, (*d*) men with congenital night-blindness.

After a section concerning methods for the examination and diagnosis of night blindness, Landolt sums up his observations thus:

"Soldiers complaining of defective night vision may be divided into two main groups: those who before the war had deficient nocturnal vision, known or unknown, and those who have become night-blind during the war. The cases of night-blindness revealed by the war include, first, a group designated as nocturnal amblyopes (false night-blindness) composed for the greater part of ametropes without correction or with faulty correction, and men with corneal lesions. A second group, the genuine night-blind, consists of men with choroido-retinal disease, pigmentary retinitis, choroiditis, congenital defects of the neuro-retinal system, but possessing a diurnal visual acuity and field sufficient for military requirements, and, lastly, congenital night-blindness of low degree.

"Both groups become cognizant of their defect because they are for the first time compelled to live a nocturnal life amid unfamiliar surroundings and find themselves, perhaps for the first time, in comparison with a large number of normal sighted individuals.

"The second category, that of night-blindness caused by the war, is, in our experience, very limited; we have not seen any well-marked cases associated with an enfeebled state of health, but have met with a few young weakly individuals, with normal vision, who complain of night-blindness. Such cases are to be considered as sick men, and are usually easily and rapidly cured by appropriate treatment. The four or five cases under our observation had completely recovered in three to four weeks, under treatment by extra diet, cod liver oil, etc.

"All my *confrères* are agreed that with the exception of cases of retinal disease with considerable contraction of the field of vision, the symptom of night-blindness alone does not justify the removal of the man from active service in the field."

J. B. LAWFORD.

(5) **Frenkel, H.—Night blindness among the mobilised auxiliary forces. (L'hemeralopie chez les mobilisés de l'intérieur.)** *Arch. d'Ophtal.*, July-August, 1917.

(5) **Frenkel**, in examining the workers in the powder factory at Toulouse, found an unusual proportion complaining of varying degrees of night-blindness. Although in a number of cases simulation of this defect from a desire to escape night work was apparent, the percentage of cases of real defect of night vision was abnormal. Frenkel thinks that this is partly explained by the fact that a very large proportion of the hands employed in the National Powder Factory are men mobilized for auxiliary service, and of such workers a large percentage are myopes. He examined, by means of Foerster's photometer, 48 individuals complaining of defective sight at night; all these proved to be night-blind. Of the total number, 30 were myopes, 2 were hypermetropes, 7 had ocular disease, the nature of which is not stated, 8 were examples of congenital night-blindness, 1 was a case of hemianopia of cortical origin.

Frenkel has found Foerster's photometer of considerable service in the detection of simulated night-blindness.

J. B. LAWFORD.

(6) **Jess.—On the aetiology of night-blindness. (Zur Aetiologie der Nachtblindheit.** *Deutsche med. Wochenschr.*, Nr. 22, p. 681, 1917. **Abstract in** *Klin. Monatsbl. f. Augenheilk.*, September-October, 1917.

(6) **Jess's** observations on the intimate connection between hemeralopia and defective colour vision, in the sense of an acquired relative blue yellow blindness, is not only of use as a diagnostic method, but also throws some light on the as yet unexplained pathology of the affection. This characteristic colour vision defect, which may go on to absolute yellow blue blindness, is a symptom of retinal oedema. In this connection recent observations during the war on so-called hunger oedema are of interest. In addition to the oedema which we know in connection with kidney disease, such processes may affect the lids to such an extent as to render it almost impossible to open them. As we recognize the occurrence of oedema in different external and internal organs as a result of toxic influence on nutrition, so also may we assume that toxic disturbance of the retinal nutrition causing oedema may lead to hemeralopia. Jess has been able to note a characteristic peripapillary oedema of the retina in several cases.

E. E. H.

CORRESPONDENCE

TRACHOMA

To the Editor of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

SIR,—At the meeting of the Ophthalmological Society on May 3, 1918, a resolution was passed calling the attention of the War Office to: (1) The danger of discharging any soldier from the Army who has contracted ophthalmia, until he has been certified as cured, by an ophthalmic surgeon. (2) The danger of allowing any soldier suffering from ophthalmia, to mix with the civil population without his having been warned as to the precautions he should take to prevent the spread of infection.

I have recently had a communication from the Secretary of the Interdepartmental Committee on Infectious Disease in relation to Demobilisation (Local Government Board), asking for any details where infectious trachoma has been introduced into this country and any instances in which the disease has recently been known to spread.

I should feel very grateful for any information as soon as possible on these points which may have come under the notice of your readers.

Yours very faithfully,

M. S. MAYOU,
Hon. Sec.

59, HARLEY STREET,
CAVENDISH SQUARE, W.1.
February 18, 1919.

NOTES

Deaths

THE accidental death is reported of Robert Alexander Lundie, once private assistant to Argyll Robertson and for some time assistant ophthalmic surgeon to the Royal Hospital for Sick Children, Edinburgh.

We regret to announce the sudden death of R. A. Reeve, of Toronto, whose face was familiar at ophthalmological gatherings in this country and on the continent of Europe. We hope to publish an account of his life in our next issue.

The following deaths are announced from America: George Cerny, of St. Louis, Mo.; William F. Conway, of Albany, N.Y.; Carl C. Culver, of Burlington, Kansas; Charles H. Davis, of Knoxville, Kentucky; Paul Guilford, of Chicago; Frederick C. Heath, of Indianapolis; Roy R. Longino, of Fort Stockton, Texas; David W. Meyer, of Brooklyn; Timothy J. Moran, of Pittsburgh; Joseph W. H. Porter, of Caribou, Maine; George R. Pretz, of Lebanon, Pennsylvania; John Ranly, of Cincinnati; James H. Reynolds, of Louisa, Kentucky; Charles R. Schoemaker, of Baltimore; William Williamson, of San Diego; and Jesse S. Wyler, of Cincinnati.

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British Medical Association

IT is a matter of common knowledge that the annual meeting of the British Medical Association has not been held during the last four years. It has now been arranged to hold a short meeting in London, in April next, for the discussion of clinical and scientific subjects. The Sections will be on a smaller scale than at a fully organized annual meeting. Committees have been appointed to make the necessary arrangements.

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Care of the Blind in Scotland

AT the annual meeting of the Royal Blind Asylum and School, Edinburgh, it was reported that the allowance had been increased by 10s. a week at the beginning of the year, an addition of 6s. being made later on, and that in order to meet these charges the citizens of Edinburgh had contributed £7,300 towards the £10,000 for which an appeal was made. Newington House had sent out men equipped to carry on work in their own localities, and these men were visited regularly. For carrying on this after-care work £42,000 had been subscribed in Scotland and elsewhere. As regards education, the age of compulsory school attendance for the blind had been raised from 16 to 18 years, and the scheme had been successful at West Craigmillar. The Carnegie Trust had made a grant of £5,000 and promised to double this amount if a similar sum can be raised before June.—*British Medical Journal.*

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Ophthalmological Society

THE next congress of the Society will take place on May 1, 2, and 3, 1919. On the first day of the meeting a discussion has been arranged on "Visual Requirements of Aviators." It will be opened by Professor Spearman, Col. Wilmer, U.S.R., and Mr. A. R. Brailey. On the same day the Bowman Lecture will be given by Dr. Victor Morax, of Paris, the subject being "Plastic Operations on the Orbital Region." On the second day there will be a discussion on "Eyesight in connection with Education," to be opened by Messrs. James Kerr, W. G. Sym, and N. B. Harman. On the third day there will be a clinical meeting at the Central London Ophthalmic Hospital, where, whenever possible, beds will be provided by the staff for patients coming from the country. During the Congress there will be an exhibition of optical glass and glass eyes.

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Institutions, etc., for the Blind

THE Local Government Board has recently issued a list of Institutions, Societies, and Agencies for the Blind in England and Wales, which have been approved and registered, on the recommendation of the Advisory Committee on the Welfare of the Blind. This list was prepared by a Sub-Committee of the Advisory Committee after a very thorough and careful investigation, and includes only those Institutions which are partly supported by voluntary contributions. It is complete up to the end of 1918, but will be subject to annual revision. It is hoped that every Institution of the voluntary type will soon be included in the list, but at present a few Societies have declined to come into line with the requirements of the Advisory Committee. The list can be obtained from H.M. Stationery Office through any bookseller, and costs one penny. It should prove a valuable guide to those interested in Societies devoted to the welfare of the blind.